Effect of extended scope physiotherapists assessments in orthopaedic diagnostic setting

a systematic review

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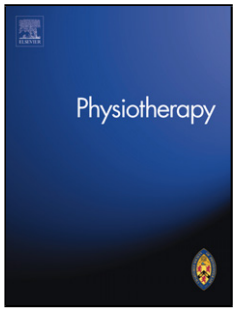

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Title:

Effect of extended scope physiotherapists assessments in orthopaedic diagnostic setting: a systematic review

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Abstract

Background Patients with musculoskeletal diseases can potentially be assessed by an extended scope physiotherapist (ESP) instead of by an orthopaedic surgeon (OS).

Objectives To evaluate the effectiveness of the diagnostic musculoskeletal assessment performed by ESP compared to OS.

Data sources MEDLINE, Cochrane Central Register of Controlled Trials, EMBASE, CINAHL, PEDro and reference lists of included studies and previous reviews were searched in November 2015.

Eligibility criteria Studies were included if they evaluated adults with a musculoskeletal disease referred to an outpatient orthopaedic clinic where a diagnostic assessment had been conducted by an ESP.

Data extraction Data were extracted using a customised data extraction sheet. Two reviewers using checklists evaluated methodological independently.

Results We included one randomised controlled trial and 31 observational studies. Diagnostic agreement between ESPs and OSs was 65–100% across studies. Health care cost savings for diagnostic assessments performed by ESPs were 27–49% compared to OSs. Overall, 77–100% of the patients were satisfied with the ESP assessment. Results were comparable on diagnostic agreement, cost and satisfaction in studies with high, moderate and low risk of bias.

Limitations Risk of bias in the included studies.

Conclusion and implication of key findings Diagnostic assessments performed by ESP may be as beneficial as or even better than assessment performed by OSs in terms diagnostic agreement, costs and satisfaction. However, the methodological quality was generally too low to determine the clear effectiveness of ESP assessment, and more high quality studies are needed.

Systematic review registration number: PROSPERO CRD42014014229

Contribution of the Paper

- Diagnostic assessments seem to be effectively performed by ESPs with regard to diagnostic accuracy, satisfaction and health care costs.
- The methodological quality of studies evaluating the effectiveness of diagnostic assessments performed by ESPs is low, and evidence to determine the true effectiveness of ESP assessment is therefore lacking.
- At present, this systematic review is the largest on this topic.

Keywords:

1. Physical Therapists
2. Orthopaedics
3. Musculoskeletal Diseases
4. Systematic Review
5. Clinical Decision-Making
6. Patient Satisfaction

Introduction

Musculoskeletal disease is the second largest global cause of disease [1] and yearly musculoskeletal pain is reported by 45% - 74% of the population. [2] Orthopaedic surgeons (OS) are the most common consulted specialists for this disease [2,3]. However, many referrals do not meet the indications for orthopaedic surgery [2-7] and could potentially be managed by a physiotherapist with special training.

In light of this, increasing reports, particular from the United Kingdom (UK) and Australia, use specially trained physiotherapists to perform musculoskeletal assessment of patients referred to an orthopaedic clinic [8]. The rationale for using physiotherapists instead of OSs to perform assessments is to reduce the load on OSs [2], reduce health care costs [9], and to shorten the orthopaedic wait time [9,10]. However, it is crucial that assessment quality is ensured, and if this procedure is going to be implemented worldwide, that patients and general practitioners (GP) are satisfied with the physiotherapists' assessments.

A consistent term for these specially trained physiotherapists is lacking why extended scope physiotherapists (ESP) [8,11], clinical specialist physiotherapist (CSP) [4,12], advanced practice physiotherapists (APP) [13] and simply physiotherapists [6,10] are used synonymously. In this review we use the term ESP. A clear definition of ESPs roles is also lacking [8] and tasks vary depending on requirements and legislation [8] - for instance some ESPs do injections, compile surgery lists and/or request imaging [2,7]. However, some agreement exists: ESPs are clinical specialists working in expanded roles and often with wide experience as practitioners and additional training in musculoskeletal physiotherapy [5,9,10,14].

Previous systematic reviews evaluating ESPs effectiveness in handling patients with musculoskeletal diseases indicate that ESPs have the ability to diagnose musculoskeletal conditions, identify patients who need surgery, and that patients are satisfied with ESPs treatment [8,11,13,15]. However, these reviews conclude that the evidence is scarce and that high quality research is needed [8,11,13]. Since the publication of previous reviews six new studies have been published [3,4,5,10,12,14]. Based on this, we decided to perform a comprehensive systematic review with the aim to evaluate the effect of using ESPs to make diagnostic assessments.

Objectives

Main outcomes are

I) Diagnostic agreement of assessments performed by ESPs and OSs, and diagnostic agreement of assessments performed by ESPs and OSs compared to arthroscopy, medical imaging or surgical findings

II) Costs of diagnostic assessments performed by ESPs as compared to assessments performed by OSs

III) Patient and GP satisfaction with diagnostic assessments performed by ESPs

Additional outcomes are

IV) Wait time for initial orthopaedic (ESP or OS) assessment

V) Relevant referrals by evaluating

- Number of patients managed solely by ESPs
- Surgical conversion rate of patients referred from ESPs to OSs and later operated on

Methods

The study was pre-registered in the PROSPERO database (registration number CRD42014014229). The PRISMA guidelines were used for reporting [16].

Eligibility criteria

Studies were included if they met the following criteria: (i) adult participants (18+) with a musculoskeletal disease referred to an orthopaedic outpatient clinic, (ii) diagnostic assessments performed by ESP, (iii) evaluated at least one of these outcomes: diagnostic agreement, costs, patient or GP satisfaction, wait time and/or relevant referrals, (iv) original studies published in peer-reviewed scientific journals, in English, Danish, Norwegian or Swedish. Exclusion criteria were: non-orthopaedic, primary care or emergency settings, no separate results for ESPs or the following study types: reviews, case series, case reports, opinion-articles, commentaries and conference abstracts.

Information sources and search

Literature was searched until November 2015 conducted by one author (JT) and a research librarian until. Studies were identified by searching five databases (MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, CINAHL and PEDro) (Table S1) and by searching the reference lists of identified studies and reviews.

Study selection

Identified studies were downloaded into Endnote (Endnote basic) and duplicates were manually removed. Two authors (JT and LRM) independently screened all titles and abstracts for eligibility. Full-text studies were obtained if one of the authors found it relevant according to the inclusion

criteria. The same two authors independently reviewed full-text studies, and consensus on inclusion was reached by discussion.

Data collection and extraction

The following data was extracted from the included articles by the main author (JT): (i) author, year and country of origin, (ii) study design, (iii) number of participants, (iv) affected body part, (v) reported study outcomes, (vi) main results according to reported study outcome and (vii) ESP experience and training. A second author (LRM) validated the extracted data. Disagreements were resolved by consensus.

Methodological quality assessment

Two authors (JT and LRM) independently appraised risk of bias with SIGN 50 checklists [17]. Studies reporting on one of the main outcomes were assessed with methodological checklists according to study outcome: studies evaluating diagnostic accuracy were assessed with the checklist for diagnostic accuracy, studies evaluating costs were assessed with the checklist for economic evaluations, and studies evaluating satisfaction were assessed with the checklist for cohort studies. Studies evaluating more than one of the main outcomes were assessed with methodology checklists according to each outcome. Studies reporting only on the additional outcomes (wait time and relevant referrals) were not assessed with methodology checklists as no appropriate checklists have been developed for these outcomes. Each methodological quality item and the overall quality were reported for each study. Disagreements were noted and resolved by consensus with a third author (CJ). Overall study quality was rated as “High” when the majority of criteria were met and the study had little or no risk bias, as “Acceptable” when most criteria were met but some flaws in the study

were associated with risk of bias, and as "Low" when either most criteria were not met or significant flaws were related to key aspects [17].

Summary measure and planned methods of analysis

Meta-analyses were planned evaluating the main outcomes. Diagnostic agreement was evaluated by assessing percentage inter-rater agreement (median value, interquartile range (IQR)) and with kappa statistics. Cost was evaluated as incremental cost-effectiveness ratio (ICER) or as percentage (median, IQR) of cost savings. The primary perspective of the cost evaluation was a health care perspective, but patient and primary care perspective were evaluated when reported in included studies. Satisfaction, relevant referrals and wait time were all evaluated as percentages (median, IQR).

Results

Study selection

A total of 3536 studies were identified. After duplicate removal 3104 references remained, of which 74 studies were assessed in full text. Thirty-two studies were included (Figure S2) of which 23 (Table 1) evaluated at least one main outcome.

Study characteristics

Included studies consisted of one randomised controlled trial and 31 observational studies (14 prospective and 17 retrospective). These studies were conducted in UK (*n* = 16), Canada (*n* = 8), Australia (*n* = 4) and Ireland (*n* = 4). The musculoskeletal diseases encompassed knee (*n* = 13), spine (n = 10), shoulder (*n* = 7), hip (n = 4) or diverse musculoskeletal parts (*n* = 9). Number of participants varied from 25 [18] to 2146 [19]. ESP experience with specialist musculoskeletal

physiotherapy varied from months [20] up to 30 years [3,6], and education in addition to physiotherapy training varied with: master's degree, advanced training in e.g. low back pain, knee or arthritis and injection therapy (Table 1 and S3).

Due to large variation in reported outcome measures only data from a small subgroup of studies within a specific outcome could have been pooled in meta-analyses. To avoid misleading outcomes we therefore did not perform any meta-analyses.

Diagnostic agreement

Twelve studies evaluated diagnostic agreement including 650 patients (Table 1). Diagnostic agreement for assessments performed by ESP compared to assessments performed by OS ranged from 65 to 100% (84%, 74% - 90%) (n = 9) [3,7,10,18,21-25]. When ESP and OS assessments were compared to arthroscopy, medical imaging or surgical findings (n = 5) [9,18,21,26,27], the diagnostic agreement was comparable for the clinicians since agreements ranged from 52 to 88% (78%, 68% - 83%) for ESP assessments and 37 to 92% (79%, 66% - 85%) for OS assessments. The overall percentage of diagnostic agreement between ESP and OS assessments was comparable for studies with high (n = 4) and acceptable (n = 4) methodological quality, ranging from 76 to 93% (86%, 82% - 89%) and from 65 to 90% (72%, 68% - 78%), respectively. The highest diagnostic agreement was however found in a study with low methodological quality (100% agreement). Kappa values ranged from 0.38 to 0.86 (n = 4), with the highest kappa values in the studies with high methodological quality. Diagnostic agreement when ESP and OS diagnosis was compared to arthroscopy, medical imaging or surgical findings was highest in the study with high methodological quality (84%, 82% - 88%) compared to studies with acceptable (79%, 75% - 82%) (n = 3) or low (45%, 41% - 48%) (n = 1) quality (Table S4). According to body part diagnostic

agreement was comparable; as for knee, hip and shoulder it was 76–89% (88%, 82% - 89%), 82% and 65–100% (83%, 74% - 91%), respectively.

Costs

Three studies performed a cost evaluation including 1634 patients. In addition, one study presented costs in their discussion section (Table 1). The ICER (*n* = 1) (5) of health care cost for ESP compared to OS assessments was Au$ 495 per quality-adjusted life year (QUALY), and the cost savings in percentage were 27–49% (31%, 29% - 40%) (*n* = 3) [14,28,29].

One study with high methodological quality found that diagnostic assessments performed in a ESP-led clinic were more expensive but also more beneficial leading to cost-effectiveness compared to assessments performed in an OS-led clinic. This conclusion was based on the assumption that health care payers will pay a threshold of Au$50 000 per QALYS. In studies where health care cost were evaluated in percentage, the cost savings were highest in the study with high methodological quality (49 % cost savings), compared to studies with acceptable or low methodological quality (27% and 31% cost savings) (Table S5). Variables as salary of specialists (ESP/OS), assessment time used, investigations ordered etc. were not consistently included in the analyses. Costs from the patient and primary care perspectives were evaluated in one study with high methodological quality, which did not find any significant cost difference between assessment performed by ESP or OS.

Satisfaction

A total of 13 studies evaluated satisfaction with ESP assessment including 1509 patients (plus participants from one study with no report of participant number) (Table 1). Proportion of patients and GPs being satisfied with ESP assessments ranged from 77 to 100% (89%, 86% - 91%) (*n* = 8) [3,6,10,23,30-33] and from 80 to 96% (95%, 87% - 95%) (*n* = 5) [6,30,31,33,34], respectively.

Three studies compared patient satisfaction between assessments performed by ESP and OS; two found satisfaction in favour of ESP (3,7) and one found no difference (28) (Table 1).

Patient satisfaction with ESP assessment was comparable in studies of high, acceptable and low methodological quality but GP satisfaction with ESP assessment was only presented as percentage in studies with low methodological quality (Table S6). The "modified VSQ-9 item scale", a standardised tool for measuring satisfaction, was used in two studies [3,7]. Another three studies used self-developed instruments [6,28,34], and the remaining eight studies did not describe which tool they had used to measure satisfaction.

Wait time and relevant referrals

Wait time for initial orthopaedic (ESP or OS) assessment (Table S7) was reduced by 26–87% (56%, 33% - 79%) (*n* = 5) [7,29,34-36] with ESP assessments, ESP-led clinics or similar solutions.

Patients assessed by ESP could be managed entirely by the ESP and did not need to see an OS in 34–99% (71%, 46% - 83%) of cases (*n* = 14) [4,9,12,14,19,20,29,31-33,35,37-40] and the surgical conversion rate of patients referred by an ESP to an OS was 25–91% (69%, 60% - 75%) (*n* = 10) [4,9-12,14,20,32,38,39] (Table S7).

Risk of bias across studies

All, except one, of the included studies were observational studies, and the methodological quality varied greatly, inducing risk of bias [17] (Table S4, S5, S6). The risk of bias concerning diagnostic agreement was frequently related to the index test or study flow and timing domains in the included studies (Table S4). The risk of bias concerning cost was frequently comprised of lack of sensitivity analyses and cost comparisons that were not made on the basis of outcomes in the included studies (Table S5). The risk of bias concerning satisfaction was related to retrospective and single group

studies, inadequately defined or discussed outcome measures, and to the lack of any mention of confounding or confidence intervals (Table S6).

Discussion

Main findings

We found 65–100% diagnostic agreement between ESP and OS assessments. When compared to medical imaging or surgical findings, the diagnostic agreement for ESP was 52 to 88% and for OS 37 to 92%. Diagnostic agreement between ESP and OS was highest in a study of low methodological quality, but when compared to medical imaging or surgery findings it was highest in a study with high methodological quality. Health care costs were reduced by 27–49%, and the ICER was AU$ 495 per QUALY was achieved based on studies of mixed methodological quality. Furthermore, 77–100% patient and 80–96% of GPs expressed satisfaction when assessments were performed by ESP; similar levels of satisfaction were found in studies of mixed methodological quality. In addition, assessments performed by ESP reduced wait time by 26-87%, 34–99% of the patients did not need to see an OS, and the surgical conversion rate of patients referred by ESP was 25-91%. The estimates from included studies had wide intervals, and the methodological quality varied greatly, but the findings across studies were comparable which suggests that ESP may be useful for making musculoskeletal diagnostic assessments.

Comparison with previous reviews

Our results are in line with previous systematic reviews, which conclude that ESP assessments are beneficial in terms of diagnostic accuracy [8,11,13], health care costs [8,13] and patient satisfaction [11,13,15]. Previous reviews had included studies with an emergency department [13] or primary care [8,11,15] setting, whereas we to increase the internal validity exclusively included studies from

orthopaedic outpatient settings. We planned to be the first to perform meta-analyses on main outcomes, but even with inclusion of six newly published studies only data from a small subgroup of these studies could have been pooled. Instead we synthesised the results individually for each main outcome, which no previoius reviews had done consistently.

Strengths and limitations of the present review

The main strength of the present review is the comprehensive literature search performed, which returned a large number of new studies, making this review the largest on this topic to date. Another strength is that our study selection and methodological quality assessment was performed independently by two authors who reported individually on quality item for each study. Methodological quality was assessed using SIGN 50-checklists with individual items for various outcomes. This is relevant because individual items affect dimentions like diagnostic agreement, cost and satisfaction differently. SIGN 50 checklists were therefore considered superior to e.g., QUEDAS-2 checklists. Furthermore, we minimised the risk of selection bias by including all studies regardless of their methodological quality as recommended by the Cochrane Handbook. Nevertheless, bias might account for some of the observed effect. More than half of the included studies used retrospective data and had only low or acceptable methodological quality, making our results susceptible to risk of bias. Eight study outcomes had a "high" methodological quality. However, these studies evaluated different outcomes, why we generally consider the methodological quality to be low for each outcome. We did not test for publication bias. Still, as the results of the included studies are quite consistent, we consider the influence of publication bias to be non-critical. We did not search for unpublished studies and did not contact any experts in this field, which could induce reporting bias. Three studies [24-26] on diagnostic agreement did not provide information regarding ESPs experience and training; and often it was not described whether

pre-specified diagnostic categories were used. Only one [5] study on cost performed a sensitivity analysis, even if this generally considered necessary to investigate uncertainty of parameters and to increase the analysis robustness. Furthermore, only two [3,7] studies used a standardised tool to measure satisfaction although this would increase reliability and validity. With the different tools used in the remaining 11 studies, it was not clear if they evaluated satisfaction with ESP, with the outcome, or with other aspects. ESP and OS assessment time was often not described in the included studies. This may have an impact on all the evaluated outcomes.

The generalisability of the result to other countries than the UK, Australia, Canada and Ireland can be questioned as all included studies were conducted in these countries and as assessments were performed by a single ESP and/or a single OS in the majority of the studies. We could have included studies with a primary care setting and thereby have included more studies as well as a Scandinavian study [2]. However, we abstained from this as the scope of this review was an orthopaedic outpatient setting, and as study results performed in different settings might show contradictory results.

We recommend conducting new studies in other countries, which should aim for high methodological quality, including comprehensive intervention description and using reliable and validated tools to evaluate satisfaction. However, justification for ESPs is highly important as reducing health care costs and releasing OS time are requested, and as diagnostic assessments performed by ESPs may be an effective way to achieve these goals.

Conclusion

This systematic review indicates that orthopaedic diagnostic assessments performed by ESPs may be as beneficial as or even better than assessment performed by OSs in terms of diagnostic accuracy, cost and satisfaction. Furthermore, that initial assessments by ESPs may lead to reduced

wait time and a large proportion of patients not needing to see an OS. However, the methodological quality of the included studies was generally too low to determine a clear effectiveness of ESPs role. We therefore encourage more high quality studies on this topic.

Ethical Approval: Ethical approval was not required for this systematic review as it is based on published data only.

Conflict of Interest: There are no conflicts of interest.

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References

(1) Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380(9859):2163-2196.

(2) Samsson KS, Larsson ME. Physiotherapy triage assessment of patients referred for orthopaedic consultation - Long-term follow-up of health-related quality of life, pain-related disability and sick leave. Man Ther 2015;20(1):38-45.

(3) Desmeules F, Toliopoulos P, Roy JS, Woodhouse LJ, Lacelle M, Leroux M, et al. Validation of an advanced practice physiotherapy model of care in an orthopaedic outpatient clinic. BMC Musculoskelet Disord 2013;14:162-2474.

(4) O'Farrell S, Smart KM, Caffrey A, Daly O, Doody C. Orthopaedic triage at a physiotherapist-led 'Musculoskeletal Assessment Clinic': A seven-month service evaluation of outcomes. Ir J Med Sci 2013;183(4):565-571.

(5) Comans T, Raymer M, O'Leary S, Smith D, Scuffham P. Cost-effectiveness of a physiotherapist-led service for orthopaedic outpatients. Journal of Health Services Research and Policy 2014;19(4):216-223.

(6) Bath B, Janzen B. Patient and referring health care provider satisfaction with a physiotherapy spinal triage assessment service. J Multidiscip Healthc 2012;5:1-15.

(7) Razmjou H, Robarts S, Kennedy D, McKnight C, Macleod AM, Holtby R. Evaluation of an advanced-practice physical therapist in a specialty shoulder clinic: diagnostic agreement and effect on wait times. Physiother Can 2013;65(1):46-55.

(8) Stanhope J, Grimmer-Somers K, Milanese S, Kumar S, Morris J. Extended scope physiotherapy roles for orthopedic outpatients: an update systematic review of the literature. J Multidiscip Healthc 2012;5:37-45.

(9) Ashmore K, Smart K, O'Toole G, Doody C. Triage of knee pain by an Extended Scope Physiotherapist (ESP) in an orthopaedic clinic: A clinical audit. Physiother pract res 2014 03;35(1):25-32.

(10) Napier C, McCormack RG, Hunt MA, Brooks-Hill A. A physiotherapy triage service for orthopaedic surgery: an effective strategy for reducing wait times. Physiother Can 2013;65(4):358-363.

(11) Oakley C, Shacklady C. The Clinical Effectiveness of the Extended-Scope Physiotherapist Role in Musculoskeletal Triage: A Systematic Review. Musculoskeletal Care 2015;13(4):204-221.

(12) Murphy S, Blake C, Power CK, Fullen BM. The role of clinical specialist Physiotherapists in the management of low back pain in a Spinal Triage Clinic. Ir.J.Med.Sci. 2013;182:643-650.

(13) Desmeules F, Roy JS, MacDermid JC, Champagne F, Hinse O, Woodhouse LJ. Advanced practice physiotherapy in patients with musculoskeletal disorders: a systematic review. BMC Musculoskelet Disord 2012;13:107-2474-13-107.

(14) Burn D, Beeson E. Orthopaedic triage: Cost effectiveness, diagnostic/surgical and management rates. Clinical Governance 2014;19(2); 126-136.

(15) Hussenbux A, Morrissey D, Joseph C, McClellan CM. Intermediate care pathways for musculoskeletal conditions-are they working? A systematic review. Physiotherapy 2015;101(1):13-24.

(16) Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009;6(7).

(17) Critical appraisal: Notes and checklists. Available at: http://www.sign.ac.uk/methodology/checklists.html. Accessed 06/18, 2016.

(18) Aiken AB, McColl MA. Diagnostic and treatment concordance between a physiotherapist and an orthopedic surgeon - A pilot study. Journal of interprofessional care 2008;22(3):253-261.

(19) Curley AE, Cassells M, Cooke G, Dowling F. Physiotherapy-led low back pain triage: results of the first two years. Physiother Ireland 2004;25(2):3-9.

(20) Hourigan PG, Weatherley CR. Initail assessment and follow-up by a physiotherapist of patients with back pain referred to a spinal clinic. Journal of the Royal Society of Medicine 1994;87:213-214.

(21) Dickens V, Ali F, Gent H, Rees A. Assessment and diagnosis of knee injuries: the value of an experienced physiotherapist. Physiotherapy 2003;89(7):417-422.

(22) MacKay C, Davis AM, Mahomed N, Badley EM. Expanding roles in orthopaedic care: a comparison of physiotherapist and orthopaedic surgeon recommendations for triage. J Eval Clin Pract 2009;15(1):178-183.

(23) Oldmeadow LB, Bedi HS, Burch HT, Smith JS, Leahy ES, Goldwasser M. Experienced physiotherapists as gatekeepers to hospital orthopaedic outpatient care. Med J Aust 2007;186(12):625-628.

(24) Oakes H. Orthopaedic shoulder clinic diagnosis and treatment plan audit. Clinical Governance 2009;14(2):126-133.

(25) Aiken AB, Harrison MM, Atkinson M, Hope J. Easing the Burden for Joint Replacement Wait Times: The Role of the Expanded Practice Physiotherapist. Healthcare Quarterly 2008;11(2):62.

(26) Gardiner J, Turner P. Accuracy of clinical diagnosis of internal derangement of the knee by extended scope physiotherapists and orthopaedic doctors: Retrospective audit. Physiotherapy 2002;88(3):153-157.

(27) Trompeter A, Shaikh N, Bateup C, Palmer S. Clinical diagnosis of soft tissue injuries to the knee by physiotherapists and orthopaedic surgeons: is there a difference between the two professions? Hong Kong Physiother j 2010;28:16-18.

(28) Daker-White G, Carr AJ, Harvey I, Woolhead G, Bannister G, Nelson I, et al. A randomised controlled trial. Shifting boundaries of doctors and physiotherapists in orthopaedic outpatient departments. J Epidemiol Community Health 1999;53(10):643-650.

(29) Harrison J, Rangan A, Shetty A, Robinson C. Reducing waiting times: physiotherapy shoulder assessment clinic. British Journal of Therapy & Rehabilitation 2001;8(2):57-59.

(30) Weale AE, Bannister GC. Who should see orthopaedic outpatients - physiotherapists or surgeons? Ann R Coll Surg Eng 1995;77 (suppl):71-73.

(31) Hockin J, Bannister G. The extended role of a physiotherapist in an out-patient orthopaedic clinic. Physiotherapy 1994;80(5):281-284.

(32) Pearse EO, Maclean A, Ricketts DM. The extended scope physiotherapist in orthopaedic out-patients - an audit. Ann R Coll Surg Engl 2006;88(7):653-655.

(33) Byles SE, Ling RSM. Orthopaedic Out-patients - A Fresh Approach. Physiotherapy 1989;75(7):435-437.

(34) Blackburn MS, Cowan SM, Cary B, Nall C. Physiotherapy-led triage clinic for low back pain. Aust Health Rev 2009;33(4):663-670.

(35) Aiken AB, Harrison MM, Hope J. Role of the advanced practice physiotherapist in decreasing surgical wait times. Healthc Q 2009;12(3):80-83.

(36) Schoch PA, Adair L. Successfully reforming orthopaedic outpatients. Aust Health Rev 2012;36(2):233-237.

(37) Rabey M, Morgans S, Barrett C. Orthopaedic physiotherapy practitioners: Surgical and radiological referral rates. Clinical Governance 2009;14(1):15-19.

(38) Hattam P. The effectiveness of orthopaedic triage by extended scope physiotherapists. Clinical Governance 2004;9(4):244-252.

(39) Heywood JW. Specialist physiotherapists in orthopaedic triage-the results of a military spinal triage clinic. J R Army Med Corps 2005;151(3):152-156.

(40) Hourigan PG, Weatherley CR. The physiotherapist as an orthopaedic assistant in a back pain clinic. Physiotherapy 1995;81(9):546-548.

Table 1
Main outcome results (n = 23): Diagnostic agreement (n = 12), costs (n = 4) and satisfaction (n = 13).

Author, Year, Country	**Study design, Body part**	**Diagnostic agreement**		**Cost**	Satisfaction		**Methodological quality**
		ESP and OS % (n)	**ESP and OS vs imaging, surgical findings and arthroscopy % (n)**	ESP vs OS (n)	**Pt. % (n)**	**GP % (n)**	
Aiken *et al.*, 2008, Canada [25]	Prospective, Knee and hip	Overall: 100% (38)			ESP: All subjects were satisfied (38)		Low (D) Low (S)
Aiken *et al.*, 2009, Canada [35]	Prospective, Knee and hip				ESP: Satisfaction was high or very high with all measures (86)		Low (S)
Aiken and McColl, 2008, Canada [18]	Prospective, Knee and shoulder	Overall: 90% - Knee: 88% (24) - Shoulder: 100% (6)	ESP: 75% (8) vs MRI or surgical findings OS: 75% (8) vs MRI or surgical findings				Acceptable (D)
Ashmore *et al.*, 2014, Ireland [9]	Retrospective, Knee		ESP: 88% (25), k = 0.80 [CI: 0.58-1.00] vs medical imaging and/or surgical findings				Acceptable (D)
Bath and Janzen, 2012, Canada [6]	Prospective, Spine				ESP: 90% (108); 66% very and 24% somewhat satisfied	Referring health care: 96%; 91% very and 5% somewhat satisfied	Acceptable (S)
Blackburn *et al.*, 2009, Australia [34]	Retrospective, Spine					87% (12)	Low (S)
Burn and Beeson, 2014, UK [14]	Prospective, Diverse areas			Health care perspective: Cost savings from triage: £ 28 377 vs additional cost from triage: £ 20 607 = 27% (£ 7770) cost savings per year (273)			Acceptable (C)
Byles and Ling, 1989, UK [33]	Prospective, Diverse areas				ESP: 88% satisfied (163)	80% (100)	Low (S)
Comans *et al.*, 2014, Australia [5]	Retrospective, Spine, knee and shoulder			Health care perspective: Au$ 112 incremental costs and 0.23 QALYs for pts seen by ESP = ICER of Au$ 495 QUALYs (980) → ESP-led clinics are cost-effective compared to OS-led clinics if health care payer will pay threshold of Au$50 000 per QALYs			High (C)
Daker-White *et al.*, 1999, UK [28]	RCT, Diverse areas			Health care perspective: £ 256 for ESP vs £ 498 for OS per pt. = 49% (£ 242) cost savings per year with ESP assessments (p<000001) (470)	ESP vs OS: No difference in dissatisfaction (p = 0.2) (n = 398)		High (C) High (S)

				Patient perspective: £ 89 for ESP vs £ 50 for OS assessment per pt. (p = 0.8) (402). Primary care perspective: £ 42 for ESP vs £ 36 for OS assessment per pt. (p = 0.17) (394)			
Desmeules *et al.*, 2013, Canada [3]	Prospective, Knee and hip	Overall: 88% (120); k: 0.86 [CI: 0.80;0.93] - Knee: 89% (109); k: 0.87 [CI:0.79;0.94] - Hip: 82% (11)			ESP: 93% satisfied (112) OS: 86% satisfied (112) ESP vs OS: Favour ESP (p < 0.0001)		High (D) High (S)
Dickens *et al.*, 2003, UK [21]	Prospective, Knee	Overall: 76% (17)	ESP 1: 84% (33) vs arthroscopy ESP 2: 80% (33) vs arthroscopy OS: 92% (33) vs arthroscopy				High (D)
Gardiner and Turner, 2002, UK [26]	Retrospective, Knee		ESP: 52% (12) vs arthroscopy OS: 37% (39) vs arthroscopy				Low (D)
Harrison *et al.*, 2001, UK [29]	Retrospective, Shoulder			£ 11 for ESP vs £ 16 for OS = 31% (£ 5) cost savings per year (perspective and n NR)			Low (C)
Hockin and Bannister, 1994, UK [31]	Retrospective, Diverse areas				ESP: 89% satisfied (189)	95% (n NR)	Low (S)
MacKay *et al.*, 2009, Canada [22]	Prospective, Knee and hip	Overall: 69% (60)					Acceptable (D)
Napier *et al.*, 2013, Canada [10]	Prospective, Knee and shoulder	Overall: 84% (45); k: 0.77 [CI: 0.60;0.94] - Shoulder: k: 0.73 [CI: 0.57-1.00] - Knee: k: 0.85 [CI: 0.52-0.94]			ESP: 100% (45) satisfied or very satisfied		High (D) Acceptable (S)
Oakes, 2009, UK [24]	Retrospective, Shoulder	Overall: 65% (26)					Acceptable (D)
Oldmeadow *et al.*, 2007, Australia [23]	Prospective, Knee, shoulder and spine	Overall: 74% (38); k: 0.38 [CI: 0.13;0.63]			ESP: 79% (38) satisfied or very satisfied.		Acceptable (D) Acceptable (S)
Pearse *et al.*, 2006, UK [32]	Retrospective, Diverse areas				ESP: 77% satisfied (126)		Low (S)
Razmjou *et al.*, 2013, Canada [7]	Prospective , Shoulder	Overall: 93% (700);			ESP vs OS: Favour ESP (p = 0.004) (100)		High (D)

		k: 0.81 [CI: 0.74;0.89]				Acceptable (S)
Trompeter *et al.*, 2010, UK [27]	Retrospective, Knee		ESP: 66% (50) vs arthroscopy OS: 82% (50) vs arthroscopy			Acceptable (D)
Weale and Bannister, 1995, UK [30]	Prospective, Diverse areas			ESP: 89% (n NR) OS: 80% (n NR) ESP vs OS: No difference	95% (n NR)	Low (S)

D: Diagnostic agreement; S: Satisfaction; C: Cost; n: participants included in evaluation of D, S or C; ESP: Extended Scope Physiotherapists; OS: Orthopaedic surgeon or consultant; GP: General practitioner; RCT: Randomised Controlled Trial; pt.: patient; vs = compared to; k: kappa score; MRI: Magnetic resonance imaging; ICER: ratio of change in incremental benefits of intervention; NR: not reported.